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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,722	06/27/2003	Robert P. Barss	DES 0003.0492	6509

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EXAMINER	
DRODGE, JOSEPH W	
ART UNIT	PAPER NUMBER
1723	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/607,722	BARSS ET AL.	
	Examiner	Art Unit	
	Joseph W. Drodge	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 June 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3 and 22-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3 and 22-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *0903*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The disclosure is objected to because of the following informalities: It lacks the required reference to the parent application now having issued as patent 6,623,639.

Appropriate correction is required.

Claims 1 and 22-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, recitation in the preamble of the hollow fiber membrane being a support membrane is confusing since the claim is unclear what is supported and , by what structure.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis et al patent 4,0202,142 in view of Calundann et al patent 5,091,087, Kalthod et al patent 5,779,897 and Ikeda et al patent 5,178,766. Davis et al disclose a polybenzimidazole membrane, that may be in the form of a hollow filament or fiber (Abstract) which has been rendered solvent resistant by cross-linking with a multi-functional ("polyfunctional") acid halide (see especially column 5, lines 52-57 and column 6, lines 13-26). Claimed inner diameters and wall thickness are disclosed at column 5, lines 33-42, and high tensile strength and elongation at break are inferred by column 7, lines 48-58.

The claims firstly differ in requiring pore size of less than 1 micron. However, it would have been obvious to one of ordinary skill in the art, to have controlled manufacturing steps to result in such pore size, since Calundann et al teach that polybenzimidazole and other polymeric membranes, are made to have pore sizes much smaller than one micron depending upon particular separation applications.

The claims secondly differ in requiring high nitrogen permeance. However, Kalthod et al teach polymeric membranes, including those of polybenzimidazole

(column 9, line 35) for various gas or liquid separations (column 9, line 56-column 10, line 15), tested for nitrogen permeation in Example 1 of column 10. It would have also been obvious to the ordinarily skilled artisan to have ensured that the membrane of Davis et al has a high nitrogen permeance, as taught by Kalthod, since such permeance is a known predictor of permeation coefficient of water in the liquid separation environments disclosed by Davis.

The claims also importantly differ in requiring the cross-linking to comprise cross-linking with multi-functional ***alkyl*** halides. However, Ikeda et al teach additional cross-linking of a polyamide membrane employed in reverse osmosis, that is firstly cross-linked with an acid halide (as in Davis) with an alkyl halide (column 5, lines 15-26). It would have been further obvious to one of ordinary skill in the art to have also modified Davis, by adding an alkyl halide cross-linking step taught by Ikeda, to increase the membranes' rejection of electrolytes while maintaining a high flux (see column 3, lines 14-33 of Ikeda).

Regarding claims 22-24, Davis also discloses contacting the membrane with the cross-linking solution, while heating, for periods of minutes to hours (column 6, line 59-column 7, line 34).

Regarding claims 25 and 26, Kalthod also teaches coating hollow fiber polymeric membranes, that may comprise polybenzimidazole, with selective coatings (column 9, lines 3-4).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kalthod et al patent 5,779,897 in view of Calundann et al patent 5,097,087, Ikeda et al patent 5,178,766 and Davis et al patent 4,020,142.

Kalthod et al disclose a separation module of bundled hollow fiber membranes having the claimed diameters (Abstract, etc.), having feed and retentate ends including feed port 12, nearby permeate removal means 18, oppositely situated retentate port 14 (figures 1 and 2 and column 6, lines 40-59), parallel hollow fibers and filaments of polymeric material that may have a permselective coating and may be comprised of polybenzimidazole (column 8, line 62-column 9, line 40), means for sealing opposite ends of the module as in tubesheets and other sealing components (column 9, lines 28-30, etc.), the module useable with varied separation environments including gas separations and reverse osmosis liquid separations (column 9, line 41-column 10, line 15). Kalthod et al also teach polymeric membranes, including those of polybenzimidazole (column 9, line 35) for various gas or liquid separations (column 9, line 56-column 10, line 15), tested for nitrogen permeation in Example 1 of column 10.

Claim 3 differs in explicit recitation of surface pore size, requirement for a high tensile strength and elongation at break, and requirement for rendering the fibers solvent-resistant by cross-linking with multi-functional alkyl halide.

Claim 3 firstly differs in requiring pore size of less than 1 micron. However, it would have been obvious to one of ordinary skill in the art, to have controlled manufacturing steps of Kalthod et al to result in such pore size, since Calundann et al

teach that polybenzimidazole and other polymeric membranes, are made to have pore sizes much smaller than one micron depending upon particular separation applications.

Claim 3 secondly differs in requiring the fibers to be cross-linked with a multifunctional halide compound and to thereby have high tensile strength and elongation. Davis et al disclose a polybenzimidazole membrane, that may be in the form of a hollow filament or fiber (Abstract) which has been rendered solvent resistant by cross-linking with a multi-functional ("polyfunctional") acid halide (see especially column 5, lines 52-57 and column 6, lines 30-36. High tensile strength and elongation at break of polymeric hollow fibers modified by cross-linking are inferred by column 7, lines 48-58 of Davis et al. It would have also been obvious to the ordinarily skilled artisan to have modified the Kalthod et al module by cross-linking the polymer so as to impart solvent resistance and greater tensile and elongation strength, as suggested or taught by Davis et al, to enable the module to be handled and transported without harm to the hollow fibers, resist fiber compaction so as to maintain high flux after extended use and enable use of the module with chemically harsh liquid separation environments.

Claim 3 also importantly differs in requiring the cross-linking to comprise cross-linking with multi-functional ***alkyl*** halides. However, Ikeda et al teach additional cross-linking of a polyamide membrane employed in reverse osmosis, that is firstly cross-linked with an acid halide (as in Davis) with an alkyl halide (column 5, lines 15-26). It would have been further obvious to one of ordinary skill in the art to have further modified the Kalthod et al module as modified by Davis, by adding an alkyl halide cross-

linking step taught by Ikeda, to increase the membranes' rejection of electrolytes while maintaining a high flux (see column 3, lines 14-33 of Ikeda).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Drodge at telephone number 571-272-1140. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda Walker, can reached at 571-272-1151. The fax phone number for the examining group where this application is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either private PAIR or Public PAIR, and through Private PAIR only for unpublished applications. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JWD

May 25, 2005

JOSEPH DRODGE
PRIMARY EXAMINER